Creating the Context and Employing Best Practices for Teacher Professional Development:
A Brief Review of Recent Research

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Patricia Cahape Hammer

West Virginia Department of Education
Division of Teaching and Learning
Office of Research
Building 6, Suite 825, State Capitol Complex
1900 Kanawha Boulevard East
Charleston, WV 25305

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Charles K. Heinlein
State Superintendent of Schools
West Virginia Department of Education

Robert Hull
Associate Superintendent
West Virginia Department of Education

Juan D'Brot
Executive Director
Office of Assessment and Accountability

Content Contact
Patricia Cahape Hammer
Coordinator
Office of Researchphammer@access.k12.wv.us

Abstract

A review of the research on teacher professional development identified an emerging consensus on important contextual and implementation characteristics that can promote or inhibit teachers' use of new knowledge and skills in their classroom practice. Findings suggest that professional development is best viewed as one component in an overall system that also requires alignment among tests, policy, and curriculum. Within this context, research has shown that effective professional development tends to have the following elements: Content and content pedagogy focus; coherence; active learning; collective participation; and duration, including at least 30 contact hours distributed across a time span of at least a year.

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EDUCATION REFORM—such as the current move to implement the Next Generation Content Standards and Objectives[1] (NxGen CSOs)—requires new teacher knowledge and significant changes in instructional practice. Yet, the approach taken to professional development often lacks coherence, focus, sufficient time and interaction, and opportunities for teachers to practice. These common deficits in education's approach to delivering professional development result from a variety of organizational, policy, and structural factors in education that have typically inhibited major change in practice (Blank, de las Alas, & Smith, 2008, p. 3). Some of those factors, as well as what recent research has revealed about supporting change in teachers' instructional practice, are the focus of this paper.

In a review of the history of educational innovation, Brown (1992) traces what she calls the Cuban-Dewey cycle, after Larry Cuban (1984; 1990), whose writings have described the intransigence of stand-and-deliver classroom practice; and John Dewey, whose approach to education reform called for situating learning in children's experience and encouraging inquiry-based instruction. In the Cuban-Dewey cycle, an education innovation is developed and tested under controlled circumstances, leading to "exhilaration, followed by scientific credibility, followed by disappointment and blame" (Brown, 1992, p. 172). Now that we are once again focusing on inquiry approaches to learning—for both students and their teachers—with the adoption of the NxGen CSOs and their strategic instructional shifts, the need to avoid the Cuban-Dewey cycle is especially evident.

Professional development is the essential mediator of the success of any innovation, especially innovations aimed at changing classroom practice. Unless it is approached systematically and

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[1] In West Virginia, the Common Core State Standards, which have been adopted by 45 states, the District of Columbia, four territories, and the Department of Defense, are known as the Next Generation Content Standards and Objectives.

with a high level of commitment, the likely result will be little change, disappointing student test scores, political fallout, and another call for education to go "back to basics."

The Role of School and District Context

What qualities make teacher training effective? Researchers have begun to tackle this question more systematically, and information has accumulated to suggest certain characteristics have the most potential for producing greater teacher learning, changes in their practice, and higher student test scores (discussed in the next section). This is not to understate the maddeningly mixed results in the research base, however. Some researchers attribute these mixed results to the role of context—that is, a program may work well in one school, but not in others. Factors such as teacher turnover, lack of coherence with other innovations being implemented simultaneously, and the level of expertise already present within a faculty can all affect what sorts of results a school will realize.

The following brief account of the work of researchers from the American Institutes for Research (AIR) illustrates the complexities of developing guidance about professional development based on research. The AIR researchers began with the most comprehensive review of the research in recent years (Yoon, Duncan, Lee, Scarloos, & Shapley, 2007). After reviewing more than 1,300 studies, they identified only nine that were conducted with sufficient rigor to address impacts of professional development on student achievement. They cautioned that with so few studies, it was unwise to generalize too broadly. Yet there were some characteristics that the nine effective professional development programs shared (Guskey & Yoon, 2009).

All of the programs that showed improvement in student achievement involved workshops or summer institutes. All involved outside experts—either the program developers or researchers—who were directly involved in presenting the ideas and helped facilitate the implementation. None of the programs involved peer coaching, train-the-trainer, collaborative problem solving, or other school-based professional learning, although the research team was quick to point out that their findings do not mean these are not good methods. We simply do not know, based on these studies, if they are or are not. The initiatives in these studies that showed the most positive effects included 30 or more contact hours. Nearly all of the studies that showed positive results for student learning included "significant amounts of structured and sustained follow-up after the main professional development activities" (p. 497). The nine programs studied focused on specific subject-related content or pedagogic practices, designed to help teachers both better understand the content they were teaching and how students best learned the contents and skills.

The AIR team did not identify a set of professional development activities common to the nine programs, but instead found that the activities were determined based on the specific content, the professional development context, and the nature of the work. Also, it is notable that the studies had relatively few participants, ranging from five to 44 teachers and 98 to 779 students. An obvious conclusion of this work was that there needs to be more high quality studies that can trace a causal relationship between professional development and gains in students learning (Yoon et al., 2007).

Unanswered, too, is the question of scalability. The professional development programs were innovative, small, and developed and implemented by their advocates, university researchers. Brown (1992) characterized such education innovation as analogous to the alpha, beta, and gamma phases of software development.

> The alpha, or developmental, phase is under the control of the advocate, and by definition it must work for there to be any later phases. It works, though, under ideal supportive conditions. Next comes the beta phase, tryouts at carefully chosen sites with less, but still considerable, support. Critical is the gamma stage, widespread adoption with minimal support. If this stage is not attempted, the shelf life of any intervention must be called into question. (p. 172)

Assuming that the nine programs identified by Yoon and colleagues (2007) were at the alpha or beta stages—including the direct involvement of their advocates—taking these programs to a district-wide or state-wide scale (or a gamma stage) introduces a large dose of context-based reality that may not have been present in the "ideal supportive conditions" present at the original research sites.

Noting the small scale of the nine studies identified by Yoon and colleagues (2007), another group of researchers from AIR obtained funding from the U.S. Department of Education (USED) for two studies—one in early reading (Garet et al., 2008) and one in middle school mathematics (Garet et al., 2011). *Each one tested models for professional development that included the elements that were common among the nine studies identified by Yoon and colleagues.* The early reading study included 270 teachers and 5,530 students with treatment teachers receiving and 35 contact hours of professional develop, with about a third receiving an additional 62 hours of coaching. The middle school mathematics study included 195 teachers and more than 11,000 students. The interventions included all teachers in the target audience (i.e., Grade 1 and 2 teachers for the reading study, and Grade 7 mathematics teachers for the middle school mathematics study) in each randomly selected school. The schools served higher than average percentages of students eligible for free and reduced-price lunch—like most federally funded research into education innovation. The researchers used designs for their studies that adhered

to USED standards of rigor for effectiveness research (see What Works Clearinghouse, 2013), thus fulfilling the call for more high quality studies.

Using our software development analogy, these two studies could be seen as representing the beta stage, perhaps even the gamma stage, of the generally accepted model for high quality professional development. Disappointingly (for policymakers and administrators) and interestingly (for researchers), neither of the PD models (35 contact hours, or 35 contact hours plus 62 hours of coaching) for early reading produced any lasting impacts on teachers or student achievement, nor did the middle school mathematics PD model—even after a second year.

So what went wrong? There were a few clues in the middle school mathematics study. During the first year, the professional development providers delivered slightly less professional development in the districts than the study called for and teachers attended only 83% of what was offered (Garet et al., 2010). Teacher turnover in the second year resulted in half of the teachers who participated in the intervention during the first year not being present for the second year, with most turnover happening during the summer between the two treatment years (Garet et al., 2011). Clearly, context and implementation issues were at play, although the study design did not include measures for looking deeply into them.

As Guskey (2009) points out, there is a critical need to understand contextual factors in schools that can make or break the best designed professional development program. Although it is frustrating for policymakers and administrators—and evaluators—to take such complexities into consideration, not doing so can lead us all to erroneous conclusions when particular interventions succeed or fail. Schools are multifaceted—especially schools that have been identified for intensive interventions—and they rarely apply innovations one at a time. Instead, they tend to implement multiple innovations simultaneously (Guskey, 2009, p. 226). Further, schools in economically distressed areas often have trouble recruiting and retaining well-qualified teachers, and have little choice but to assign teachers to classes outside of their areas of certification. Teachers in these circumstances may benefit from a professional development program, but then they often move on to more desirable teaching positions elsewhere. As Guskey noted, "These real-world contextual differences profoundly influence the effectiveness of professional development endeavors" (2003, p. 16).

Another layer of complexity is added by the wide variations in teachers' approaches to professional learning, reflecting each teacher's own experiences as a student, and his or her beliefs, values, theories, and images grounded in the past. All of these factors influence teachers' decisions about what they are willing to learn and practice in their classrooms (Opfer & Pedder, 2011). Additionally, even when teachers are ready and willing to try new approaches to their

instruction, they may be so pressed by other demands that they lack the time for planning, individually and with colleagues during the school day to successfully implement a program (Penuel, Fishman, Gallagher, Korbak, & Lopez-Prado, 2008).

Penuel, Fishman, Yamaguchi, and Gallagher (2007) suggest that in addition to conducting experimental tests of various professional development designs, researchers must examine "conditions required for effective *scaling* of programs, which requires different research designs and methods in which the focus is on predicting high-quality implementation of programs . . . ," especially methods "that allow researchers and educational decision makers to understand how actions at different levels of the system (e.g., district, school, individual) can influence implementation and scaling processes" (p. 926).

An example of one such study looked at spillover effects of professional development at the school level, employing a model for knowledge transmission used by economists (Sun, Penuel, Frank, Gallagher, & Youngs, 2013). These researchers found that when teachers attended professional development programs on teaching writing, they were more likely to provide help to others in their school and, in some cases, the spillover effects on the instructional practices were nearly equal to the direct effects of teachers' participation in professional development (p. 17). Such findings could have implications for the design of professional development, that is, for designing programs that not only include developing participants' knowledge and instructional expertise, but also their ability to collaborate with other teachers. However, again, context matters. Other work by these researchers found that when teachers are not working within a cohesive professional environment, they are reluctant to ask others for help (Penuel & Gallagher, 2009, in Sun et al., 2013).

So, while researchers continue to investigate these issues, policymakers and administrators experience the press of deciding how to move forward with the reform agenda at hand, which inevitably involves supporting educators through some sort of change via professional development. For this reason, we offer suggestions in the following sections about how to proceed. And with these important cautions in mind about the nature of the information that research has to offer and the importance of understanding the contexts within which teachers do their work, the remainder of this review describes the features that have accumulated the most evidence as contributing to gains in teacher knowledge, changes in their practice, and/or gains in student achievement.

Five Practices That Have Shown Results

Evidence has accumulated in recent years for using five practices in the conduct of professional development: *content focus*, *coherence*, *active learning*, *collective participation*, and *sufficient duration and timespan*. We have already touched on some of these practices. Here we will go into more

depth about each one. One important note about the studies cited: Many of the professional development programs studied in the cited research were in the mathematics and science content areas, with fewer focusing on reading and literacy. Still, some general patterns emerged across content areas, described here.

Content focus

The need for *content focus* in professional development emerged as a critical component in the vast majority of studies. Content focus includes both deepening teachers' knowledge of the subject matter they are teaching and the pedagogical approaches that have been shown to be successful in helping students learn that subject matter (Blank, de las Alas, & Smith, 2008; Carpenter et al., 1989; Clewell et al., 2004; Cohen & Hill, 1998, 2001; Desimone, Porter, Garet, Yoon, & Birman, 2002; Desimone, Smith, & Phillips, 2013; Doppelt et al., 2009; Garet et al., 2001; Kennedy, 1998; McCutchen et al., 2002; Penuel, Fishman, Yagamuchi, & Gallagher, 2007; Yoon et al., 2007). This means aligning the professional development teachers receive with the instruction they will provide for their students. In a study of a statewide program that worked to improve mathematics instruction across California, Cohen & Hill (1998) found that when there was alignment among tests, policy, and curriculum, and "when curriculum for improving teaching overlaps with curriculum and assessment for students, teaching practice and student performance are likely to improve." But they also found that "Policies that do not meet these conditions—new assessments or curricula that do not offer teachers adequate opportunities to learn, or professional development that is not grounded in academic content—are less likely to have constructive effects" (p. 33).

When teachers know less, students often learn less. In a study of first-grade reading instruction focusing on the use of explicit decoding instruction, the researchers found that simply increasing the amount of time spent on this activity did not improve students' word-reading skill growth—and could actually detract from student learning. According to Piast, Connor, Fishman, & Morrison (2009), the more time teachers with high knowledge scores spent teaching explicit decoding instruction, the greater was their students' word-reading skill growth. In contrast, the more time teachers with low knowledge scores spent teaching explicit decoding instruction, the weaker were their students' word-reading scores, controlling for initial status.

Coherence

Coherence involves providing professional development experiences in a progression that builds on previous experiences and aligns with school goals and with state standards, curriculum, and assessments. Coherent professional development programs encourage continuing professional communication among teachers, either in their own school or with others in the district who teach similar subject matter or students (Cohen & Hill, 1998; Desimone et al., 2002; Garet et al.,

2001; Grant, Peterson, & Shojgreen-Downer, 1996; Lieberman & McLaughlin, 1992). Professional development that has such coherence supports change in teaching practice, even after the effects of enhanced knowledge and skills are taken into account (Garet et al., 2001; Penuel, Fishman, Yagamuchi, & Gallagher, 2007).

Active learning

Professional development is more effective when it has "active learning opportunities, such as reviewing student work or obtaining feedback on teaching" (Desimone et al., 2002, p. 102). Garet and colleagues (2001) characterized active learning as including, among other things, the "opportunity to observe expert teachers and to be observed teaching; to plan how new curriculum materials and new teaching methods will be used in the classroom; to review student work in the topic areas being covered; and to lead discussions and engage in written work" (p. 925). Penuel, Fishman, Yagamuch, and Gallagher (2007) also noted the importance of including time during professional development academies, workshops, or follow-up sessions for teachers to plan for implementation in their classrooms.

Collective participation

Effectiveness can be increased when professional development has collective participation of teachers from the same school, department, or grade (Desimone et al., 2002, p. 102; Desimone, Smith, & Ueno, 2006; Johnson, Kahle, & Fargo, 2007; Penuel, Fishman, Yagamuchi, & Gallagher, 2007; Saunders, Goldenberg, & Gallimore, 2009). Garet and colleagues (2001) describe the advantages of professional development planned for groups of teachers from the same school:

- Increased opportunity to discuss concepts, skills, and problems that arise during the professional development experiences

- Common curriculum materials, course offerings, and assessment requirements . . . and a potential to integrate what they learn with other aspects of their instructional context

- By sharing the same students, the ability to discuss [their] needs across classes and grade levels

- The ability to sustain changes in practice over time, "as some teachers leave the school's teaching force and other new teachers join the faculty . . . [contributing] to a shared professional culture, in which teachers in a school or teachers who teach the same grade or subject develop a common understanding of instructional goals, methods, problems, and solutions" (p. 922)

This scenario likely played out in a longitudinal study by Johnson, Kahle, and Fargo (2007), which followed a group of middle school students through 3 years of science education in a school where all 11 science teachers were engaged in professional development based on the

National Science Education Standards. The professional development began with a 2-week summer institute, and continued with monthly, full-day follow-up sessions for the subsequent 3 school years. The same cohort of the participating teachers' students was tested each year in March and their scores were compared with a matched cohort of students in a school where teachers did not receive the professional development program. Although there was no difference in the scores between the two groups after the first year in the program, the subsequent two years saw dramatic gains at the intervention school compared with the nonintervention students. The authors attributed the success of the program to the combination of taking a whole-school approach and sustaining the professional development for 3 years, which leads us to the next characteristic of effective professional development.

Duration and time span

There is not much agreement about the specific number of hours needed to effect change through professional development. Different reviewers suggest different numbers of hours, and at least one reviewer suggests that the amount of time spent is less important than the quality of the experience. Kennedy (1998) reviewed a collection of studies that included student impacts data for mathematics and science programs, and noted that some professional development of relatively short duration outperformed or equaled other programs of much longer duration. She concluded that "total contact time is not as important a dimension of teacher inservice as is the content that is actually taught" (p. 14). She found that the programs that had the greatest impact were those that focused on developing teachers' content and content pedagogical knowledge.

Logically, however, the time required would vary by the complexity of the material and difficulty teachers would have in mastering and applying the skills it calls for. For example, it would take less time to learn to use a new technology resource than to master the strategic instructional shifts in the NxGen CSOs. To get a sense of the variety of findings about the amount of time needed to show positive impacts on teacher practice and/or student achievement, consider these influential reviews of the literature:

- Blank and colleagues (2008) found in their review of science and mathematics professional development offered across 14 states that the time needed in professional development to produce significant effects was 50 hours.

- Clewell and colleagues (2004) identified 18 high quality evaluation studies—all in science and mathematics. They concluded that the amount of time *is* important, although they acknowledged Kennedy's concern about how that time is spent. They concluded that to produce teacher behavioral change, a minimum of 80 hours of intensive professional development was needed; and to change the culture of a teacher's classroom, 160 contact hours were required. They also noted that "coincidentally, the

most effective model [in Kennedy's (1998) review] reported 80 in-service contact hours, which was the minimum effective contact time found by other research" (p. 13).

- Yoon and colleagues (2007) noted that among the nine studies they identified in their review as providing rigorous evidence of professional development improving student achievement, 30 hours seemed to be the minimum.

Simply looking at the total number of contact hours does not paint the full picture, though. Garet and colleagues (2001), in a study of more than 1,000 professional development experiences offered through the Eisenhower Professional Development program, looked at two dimensions of duration—time span and contact hours. They found that both dimensions positively and independently influenced core aspects of the professional development experience, allowing for more opportunity for active learning; promoting coherence by "including more connections to teachers' goals and experiences, alignment with standards, and professional communication with other teachers" (p. 933); and increasing the focus on mathematics and science content. They concluded, "The fact that both time span and contact hours have independent effects on our measures of core features suggests that both dimensions of duration are important" (p. 933). Further, time span and duration outperformed any particular format for professional development—that is, workshops, institutes, and courses (traditional formats) worked about as well as study groups, mentoring, or coaching (reform formats), that were of the same duration (Garet et al., 2001).

As mentioned earlier, Johnson, Kahle, and Fargo (2007) pointed out that it can take some time before impacts of professional development become evident. The middle school science students in their study did not show achievement gains resulting from their teachers' first year of professional development, but their performance rose strongly in the second and third years of the study compared with a matched control group. Another 3-year, large scale study in Los Angeles showed that in a multifaceted professional development program in inquiry science education, the features of scientific inquiry to which the teachers were most frequently exposed over time were those that showed the greatest change in teacher practice (Grigg, Kelly, Gamoran, & Borman, 2013)

Combining both the elements of active learning and time span, learning gained in professional development events (e.g., academies and workshops) can be followed up in teachers' work settings via professional learning communities (PLCs) and coaching.

Professional learning communities
One method for supporting ongoing professional development at the school level has been the establishment of PLCs, which are intended to capitalize on the knowledge and skills of experienced teachers. In fact, a large industry has grown up around the concept of PLCs,

producing texts and workshops to guide their development (Bausmith & Barry, 2011). Yet there is little evidence to support the ability of PLCs—*in and of themselves*—to meet the new expectations for teaching and learning that will be required to fully implement the Common Core State Standards (Bausmith & Barry, 2011; Saunders, Goldenberg, & Gallimore, 2009). This may be especially true for schools that need change the most, which may have difficulty recognizing their need for knowledge beyond what they have available among their own faculty members. As noted by Hiebert and colleagues (2002, p. 8), "Local knowledge is immediate and concrete but almost always incomplete and sometimes blind and insular."

A well-functioning PLC can play a crucial role, however. Cobb and Jackson (2011) consider them to be a central element in school-based professional development, providing opportunities for teachers to collaborate in addressing problems, to integrate ideas and tools introduced in district-based professional development, and to rehearse practices. PLCs work best when they have good leaders, who set agendas, facilitate activities, and practice professional routines for interaction. These researchers view instructional coaches as the most likely candidates for providing such leadership. Further, for PLCs to have an impact on professional growth requires that teacher deprivatize their practice—that is, that they willingly discuss problems they encounter in practice, especially in their efforts to implement new instructional approaches.

Coaching

In addition to leading school-based PLCs, Cobb and Jackson (2011) suggest other ways that coaches can work productively with teachers beyond the usual classroom observations and feedback that instructional coaches are known to provide. Based on their research and others', potentially productive activities include co-teaching, including jointly planning a lesson, observing the enactment of the lesson, and then debriefing on how it went. Tying such experiences to other professional development, such as summer academies offered by the school district, further strengthens its impact.

Creating the Context for Successful Professional Development

A high quality professional development program will both lend coherence to teachers' professional development experiences, and deepen their knowledge of content and pedagogical skill in teaching it. Yet, in a longitudinal study of professional development in 30 schools in five states, Desimone and colleagues (2002) note that schools generally do not have a coherent, coordinated approach to professional development. Instead, the choice of professional development is largely up to the individual teacher—and teachers typically choose from options available from a highly disparate set of providers. The researchers recommend that schools and districts be more strategic and systematic in their planning for professional development.

Aside from the lack of coherence among the options available, a purely voluntary system also becomes problematic when teachers do not make choices that address their own knowledge gaps. A recent study revealed that teachers do sometimes avoid professional development on topics in which they are less proficient. Desimone, Smith, and Ueno (2006) found in a large-scale study of teachers of eighth-grade students selected to participate in NAEP (n=1,218) that teachers who already had strong mathematics content knowledge were far more likely to engage in sustained, content-focused professional development than those with weak content knowledge in mathematics. In light of these findings they offered four options for administrators and policy makers to consider: (a) encourage teachers to overcome their anxieties about engaging in challenging professional development by scaffolding and matching activities to teachers' levels of expertise; (b) get teachers onboard to improve their skills by building links between their professional development activities and the school's vision; (c) require teachers to take high-quality professional development to address deficiencies that have been detected through classroom observations or other evaluation activities; and (d) stop providing low-quality, ineffective professional development (Desimone, Smith, & Ueno, 2006, p. 179).

Further investigating what factors influence teachers' participation in professional development, Phillips, Desimone, and Smith (2011) analyzed a large national sample of high school mathematics and science teacher data, collected in the Schools and Staffing Survey. They found that *school* policies had more influence in promoting teacher participation in content-focused professional development than *state* policy, especially for high-stakes subject areas, such as mathematics. Teachers (a) who reported they had some influence over school policy, (b) whose principals frequently observe and supervise them, and (c) who are in schools with stable leadership tended to participate in more content-focused professional development. So it appears there is an important opportunity at the school level to deliver stable and consistent messages about learning goals for both teachers and students—and thereby gain buy-in from teachers and

Choosing the Right Professional Development Facilitators

Guskey (2009) recommends that schools and districts challenge vendors and consultants to provide better evidence of the success of their programs (not just anecdotes), including claims that their offerings are "research-based." He suggests,

Presumably they are attempting to add credibility to their statements, but too often that credibility is unjustified. Upon hearing this phrase, we need to ask immediately, "What research?" "When was it conducted?" "Are the results applicable to our setting?" and "How trustworthy are those results?" Consultants should know the research in sufficient depth to answer those questions. And if they do not, then at least they should have the honesty and integrity to say, "I don't know." (p. 228)

influence their choices about professional development accordingly, even in a voluntary program.

Professional development, as part of a reform strategy is only one element, however, in creating an instructional system that improves both teacher and student learning. Cobb and Jackson (2011) propose the following elements (below) be included in a coherent instructional system for teaching mathematics. Although their focus is on mathematics, the following elements draw from a large body of research across other content areas—so one could conjecture that such a system pertains more generally. In any case, they outline a system that includes elements that at this point, will be familiar:

- Explicit goals for students' learning

- A detailed vision of high-quality instruction that specifies particular instructional practices that will lead to students' attainment of the learning goals

- Instructional materials and associated tools designed to support teachers' development of these practices

- District teacher professional development that focuses on the specific practices, is organized around the above materials, and is sustained over time

- School-based professional learning communities (PLCs) that provide ongoing opportunities for teachers to discuss, rehearse, and adapt the practices that have been introduced in district professional development

- Classroom assessments aligned with the goals for students' learning that can inform the ongoing improvement of instruction and the identification of students who are currently struggling

- Additional supports for struggling students to enable them to succeed in mainstream classes (adapted from Cobb & Jackson, 2011, p. 12)

Creating such an instructional system is, in essence, helping to *create the context needed to allow professional development to exercise its full potential* for producing changes in teacher practice and student learning. While taking this kind of systematic approach does not address all contextual issues—for example, high teacher turnover in some communities—research suggests that these are the elements needed to support changes in teacher practice, which will in turn improve student learning.

To pull these elements into a cohesive system, however, requires not only teacher learning but also organizational learning at every level in the system, such that administrators and educators

at the state, regional education service agency, district, and school levels are all working together toward the same set of goals with mutual understandings.

Conclusions

Teachers' professional development does not happen in a vacuum and should not be a purely individual pursuit. Research suggests that professional development is best viewed as one component in an overall system that also requires alignment among tests, policy, and curriculum. Further, when curriculum for improving teaching overlaps with curriculum and assessment for students, teaching practice and student learning are more likely to improve. On the other hand, when policies and implementation do not meet these conditions—for example, by introducing new assessments or curriculum without offering teachers adequate opportunities to learn them or by offering professional development that is not well aligned— the chances for success are greatly reduced. Within this context, research has shown that effective professional development tends to have the following elements:

- *Content and content pedagogy focus*—This element includes both deepening teachers' knowledge of the subject matter they are teaching and the pedagogical approaches that have been shown to be successful in helping students learn that subject matter. Effectiveness is improved if the professional development uses the curriculum materials that teachers will later use with their students.

- *Coherence*—This element involves providing professional development experiences in a progression that builds on previous experiences and aligns with school goals and with state standards, curriculum, and assessments. Coherent professional development programs encourage continuing professional communication among teachers, either in their own school or with others in the district who teach similar subject matter or students.

- *Active learning*—Opportunities for active learning can include reviewing student work, practicing a new skill and obtaining feedback, planning how new curriculum materials and new teaching methods will be used in the classroom, and engaging in discussions and in written work.

- *Collective participation*—Professional development that has collective participation of teachers from the same school, department, or grade helps increase opportunities to discuss concepts, skills, and problems that arise when teachers work to integrate what they have learned into their classroom practice. Over time, it can lead to a professional culture in which teachers in a school or teachers who teach the same grade or subject develop a common understanding of instructional goals, methods, problems, and

solutions—an understanding that is sustained over time, even when some teachers leave and others join the group.

- *Duration, including time span and contact hours.* Depending on the complexity and difficulty of the knowledge and skills teachers are learning, the number of contact hours may vary, but research suggests that at least 30 hours are needed to impact student achievement. Sustaining the experience over one or more school years is also important, allowing for more opportunity for teachers to try out new practices and benefit from additional feedback and communication with trainers, coaches, or colleagues in professional learning communities in their schools.

A Note About the Method Used in Reviewing the Literature Cited in This Review

The enormity of the research literature on teacher professional development called for a systematic, but realistic approach to selecting the most influential and best designed studies and literature reviews. I restricted my reading primarily to articles published in top-tier, peer-reviewed journals and to reports from recognized sources of high-quality research, such as U. S. Department of Education-funded studies and programs. I began by searching the federal What Works Clearinghouse, where I found the literature review by Yoon and associates (2007) at AIR. Using EBSCO, ERIC, Google Scholar, and the West Virginia Library Commission's interlibrary loan service, I was able to obtain articles cited in the Yoon et al. (2007) bibliography. From those articles, I was led to a host of other research studies, each of which led me to additional projects. But most of this literature looked back to work done in the late 1990s and early 2000s. The last phase of my review involved identifying key researchers and research teams cited in the earlier studies, and then going back to EBSCO, ERIC, and Google Scholar to locate their more recent work and the current work of others they are citing. The reference list here represents the most influential of the studies I read. No doubt there is other work that ought to appear in this list, but I present this review with some confidence that it describes the major findings from recent research about professional development for teachers, including important factors affecting how much they gain from these experiences.

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James B. Phares Ed.D.
State Superintendent of Schools